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10/540,732

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LUC-015

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EXAMINER

YAMNITZKY, MARIE ROSE

ART UNIT

PAPER NUMBER

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/540,732	<b>Applicant(s)</b> KATHIRGAMANATHAN ET AL.	
	<b>Examiner</b> Marie R. Yamnitzky	<b>Art Unit</b> 1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 24 June 2005 and 18 July 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 33-55 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 33-55 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>18 July 2005</u>  | 6) <input type="checkbox"/> Other: _____                          |

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1. The disclosure is objected to because of the following informalities:

There is no brief description of the drawings.

Appropriate correction is required.

2. Claims 33-55 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The scope of diiridium compounds having the general chemical formula set forth in claim 33, with claims 34-55 dependent therefrom, is not clear because of inconsistencies between the definition of  $R_1$ - $R_4$  as set forth in claim 33, and the definition of  $R_1$ - $R_4$  as set forth in claims 34 and 54. While claim 33 defines  $R_1$ - $R_4$  as independently selected from hydrogen and substituted and unsubstituted hydrocarbyl groups, claims 34 and 54 set forth possibilities for  $R_1$ - $R_4$  other than hydrogen and hydrocarbyl groups.

The scope of compounds according to present claims 34 and 54, with claim 55 dependent from claim 54, is unclear not only because of the inconsistencies between the definition of  $R_1$ - $R_4$  as set forth in claim 33, and the definition of  $R_1$ - $R_4$  as set forth in claims 34 and 54, but because the recitation of " $R_1$ ,  $R_2$  and  $R_3$  can also form...ring structures" is confusing. It is not clear what  $R_1$ ,  $R_2$  and  $R_3$  can form ring structures with. For example, does the claim language mean that these three R variables can form a ring structure by joining together with each other?

The metes and bounds of claims 38-41 are not clear because the scope of an “effective amount” of an electroluminescent europium complex as recited in claim 38, with claims 39-41 dependent directly or indirectly therefrom, is not clear.

Claim 39 is confusing in defining  $L\alpha$  as an organic “complex”. Since  $L\alpha$  is part of a complex with Eu, it appears that the last word of claim 39 should be --ligand-- rather than “complex”.

Claim 44 is confusing in referring to “aromatic amine complexes”. While the phrase “aromatic amine” refers to a class of compounds conventionally used in the art for hole transporting layers, it is not clear what is meant by an aromatic amine “complex”.

Claim 45 recites “a polymer selected from” followed by a list that includes non-polymeric materials (TPD, and the oligomers recited in the last two lines). It is not clear if the hole transmitting material per claim 45 must be a polymer (in which case, TPD and the oligomers should be deleted from the list), or if the hole transmitting material may be any in the list (in which case, the examiner suggests changing “polymer” to --material-- in line 2 of claim 45).

Claim 50 is confusing in requiring the hole transmitting material and the diiridium compound to be mixed to form one layer, while depending from claim 42 which requires a layer of hole transmitting material between the first electrode and the diiridium compound layer. It is not clear how the material and compound can be mixed to form one layer and still meet the “between” limitation of claim 42.

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Similarly, claim 51 is confusing in requiring the electron transmitting material and the diiridium compound to be mixed to form one layer, while depending from claim 46 which requires a layer of electron transmitting material between the second electrode and the diiridium compound layer.

The layer structure of the device according to claim 52 is unclear. It is not clear if the copper phthalocyanine layer and the lithium fluoride layer must be between the pair of electrodes, or on the electrode surfaces that face away from each other, or some other arrangement.

3. Regarding claim interpretation:

Claim 41 includes the abbreviation “Eu(DBM)<sub>3</sub>OPNP”. The examiner interprets “DBM” as referring to dibenzoylmethane (per p. 8 of the specification), which is a  $\beta$ -diketone within the scope of formula (I) on page 11, and “OPNP” as referring to a ligand of formula (XVIII) as shown on page 15 wherein each Ph is phenyl (per p. 16). If the examiner’s interpretation of this abbreviation is incorrect, clarification is required.

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 33-37, 42-44, 46-51 and 53-55 are rejected under 35 U.S.C. 102(e) as being anticipated by Tsuboyama et al. (US 2003/0152802 A1).

See the entire patent application publication. In particular, see Fig. 1A-1D, paragraphs [0001]-[0005], [0008]-[0009], [0015], [0027]-[0035], [0037] and [0065] (especially formulae 15 and 20-34 on pages 7-8 ), and compound Nos. 211-225 and 269-275 as defined in Tables 5 and 6 (pp. 10-11).

Each of Tsuboyama's metal coordination compound Nos. 211-225 and 269-275 are electroluminescent diiridium compounds having the general chemical formula set forth in present claims 33 and 54 wherein each of  $R_1$ - $R_4$  is a hydrocarbyl/aliphatic group, and  $L_1$  and  $L_2$  are the same organic ligand (in the case of Nos. 211-225) or different organic ligands (in the case of Nos. 269-275). Each of prior art compound Nos. 211-225 and 269-275 meets the limitations of the diiridium compound as claimed in present claims 33 and 34, with Nos. 211-217, 222, 223 and 269 further meeting the limitations of present claim 35.

Tsuboyama's metal coordination compounds are disclosed for use in the luminescence layer of an organic luminescence device comprising a luminescence layer positioned between an anode and a cathode. Each of prior art compound Nos. 211-225 and 269-275 meets the limitations of the diiridium compound required for the device of present claim 36 and dependents, 37 and dependents, and 53 and dependents.

With respect to the further limitations of the device of claims 42-44, 46-48, 50, 51 and 53-55, Tsuboyama's device may have a layer of a hole transmitting material between the anode and the luminescence layer comprising the diiridium compound, as when the devices have the structure shown in Fig. 1A, 1B or 1C (hole transport layer **13**). Tsuboyama's device may also

have a layer of an electron transmitting material between the cathode and the luminescence layer comprising the diiridium compound, as when the devices have the structure shown in 1B or 1C (electron transport layer **16**; the exciton diffusion-prevention layer **17** in the Fig. 1C structure also inherently transmits electrons). In devices of Tsuboyama's examples,  $\alpha$ -NPD, which is an aromatic amine, is used in the hole transport layer between the anode and the luminescence layer. In devices of Tsuboyama's examples, Alq3, which is a metal (aluminum) quinolate, is used in the electron transport layer between the cathode and the luminescence layer. CBP, which is known to be capable of transporting both electrons and holes, is used in the luminescence layer in amounts within the range of present claims 50 and 51.

With respect to the further limitations of the device of dependent claim 49, Tsuboyama teaches in paragraph [0005] that aluminum, magnesium and alloys thereof are conventionally used in EL devices, and in devices of Tsuboyama's examples, the cathode comprises a layer of aluminum-lithium alloy and a layer of aluminum.

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 44 and 47-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuboyama et al. (US 2003/0152802 A1) as applied to claims 33-37, 42-44, 46-51 and 53-55 above, and for the further reasons set forth below.

Tsuboyama et al., in disclosing compound Nos. 211-225 and 269-275 as examples of metal coordination compounds that can be used in the luminescence layer of a device having the layered structure depicted in any of Fig. 1A-1D, anticipates a device comprising, in combination, a first electrode, a luminescence layer comprising any of compound Nos. 211-225 and 269-275, and a second electrode, and further comprising a hole transmitting layer positioned between the first electrode and the luminescence layer and/or an electron transmitting layer positioned between the second electrode and the luminescence layer.

While Tsuboyama et al. teach layer compositions within the scope of those required by present claims 44 and 47-51, Tsuboyama et al. do not disclose a specific example of a device comprising any of compound Nos. 211-225 and 269-275 in a device having the further layer compositions required by claims 44 and 47-51. To the extent that the lack of a specific device example comprising any of Nos. 211-225 and 269-275 in a device structure comprising these further layer compositions could be considered to render the reference non-anticipatory, it is the examiner's position that the devices according to claims 44 and 47-51 would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention. Given Tsuboyama's teachings that any of compound Nos. 211-225 and 269-275 can be used for the same purpose as compound Nos. 1 and 46, it would have been *prima facie* obvious to one of ordinary skill in the

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art at the time of the invention to use any of Nos. 211-225 and 269-275 in place of Nos. 1 or 46 in devices such as in Tsuboyama's Examples 1-3 and 5-8.

8. Claims 38-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuboyama et al. (US 2003/0152802 A1) as applied to claims 33-37, 42-44, 46-51 and 53-55 above, and further in view of Kathirgamanathan (WO 98/58037).

Tsuboyama et al. do not disclose mixing the diiridium compounds with an electroluminescent europium complex. Electroluminescent europium complexes within the scope of those required for present claims 38-41 were known in the art at the time of the invention. Kathirgamanathan discloses such europium complexes. For example, see Examples 6-10 on pages 9-13 of WO '037. The europium complex required by present claim 41 is the complex of Example 6 in WO '037. Further it was known in the art at the time of the invention that more than one light-emitting material could be used in combination so as to alter the color of light emitted by the device. Absent a showing of superior/unexpected results commensurate in scope with present claims 38-41, it is the examiner's position that it would have been a *prima facie* obvious modification to one of ordinary skill in the art at the time of the invention to use combinations of known electroluminescent materials, such as the diiridium compounds taught by Tsuboyama et al. and the europium complexes taught by Kathirgamanathan, in the luminescence layer of an EL device.

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9. Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuboyama et al. (US 2003/0152802 A1) as applied to claims 33-37, 42-44, 46-51 and 53-55 above, and further in view of Mori et al. (US 5,281,489).

Tsuboyama et al. utilize  $\alpha$ -NPD for the hole transporting layer in the device examples. While Tsuboyama do not explicitly teach the use of any of the materials recited in present claim 45, materials within the scope of claim 45 were known in the art at the time of the invention to be useful as hole transporting materials. For example, see column 4, lines 44-46 and c. 7, l. 56-57 in the patent to Mori et al. It would have been an obvious modification to one of ordinary skill in the art at the time of the invention to use other known hole transporting materials in place of, or in combination with,  $\alpha$ -NPD in a hole transport layer of a device according to Tsuboyama et al.

10. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuboyama et al. (US 2003/0152802 A1) as applied to claims 33-37, 42-44, 46-51 and 53-55 above, and further in view of Lamansky et al. (US 2002/0182441 A1).

Tsuboyama et al. do not disclose a device further having a layer of copper phthalocyanine (CuPc) and a layer of lithium fluoride (LiF) in the multilayered structure. Lamansky et al. disclose multilayered device structures having a hole transport layer, a luminescence layer, and an electron transport layer, in the order listed, between an anode and a cathode, wherein the luminescence layer comprises an iridium organometallic complex, and further comprising a CuPc layer between the anode and the hole transport layer, and a LiF layer between the electron

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transport layer and the cathode. For example, see paragraphs [0020]-[0021] and [0097]-[0098].

It would have been an obvious modification to one of ordinary skill in the art at the time of the invention to include layers of other materials in Tsuboyama's multilayered device structures selected from materials known in the art based on the suitability of those materials in the overall device structure.

11. Miscellaneous:

In line 2 of claims 35 and 55, "phenylpyridines" should read --phenylpyridines--.

12. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (571) 272-1531. The examiner works a flexible schedule but can generally be reached at this number from 7:00 a.m. to 3:30 p.m. Monday-Friday.

The current fax number for all official faxes is (571) 273-8300. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (571) 273-1531.)

/Marie R. Yamnitzky/  
Primary Examiner, Art Unit 1794

MRY  
August 16, 2008